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Abstract
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THE DISTRIBUTION OF INHERITANCE
AND THE INEQUALITY OF WEALTH WITHIN FAMILIES

by

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THE DISTRIBUTION OF INHERITANCE AND THE INEQUALITY OF WEALTH WITHIN FAMILIES [1/]

by JAMES D. ADAMS

I. Introduction

Although it has long been recognized that inheritance affects overall wealth dispersion, and is probably a source of its positive skewness as well, few studies seem to have been undertaken which attempt to trace the manner of this influence. Throughout this paper, the term family refers to the nuclear family. Analyzed along family lines, wealth is characterized by dispersion within families and by dispersion between families. The primary purpose of this paper is to examine the relationship of inheritance to within family inequality, although its between family aspect is also more briefly discussed.

As will be demonstrated below, if inheritance were larger to the more disadvantaged sons or daughters within a family, it would reduce the dispersion of wealth within families. If instead inheritance followed a "custom" of equal division, it would not directly influence within family inequality, even though it increased inequality between families.

The first example is referred to as Compensatory Inheritance, because less advantaged persons within a family are compensated for lesser wealth. It illustrates a largely unrecognized ambiguity in the link between inheritance and the dispersion of wealth. Only if inheritance increases the between family component by more than it decreases the within family component does it increase overall wealth inequality.

From a policy point of view, the issue of Compensatory Inheritance is not unimportant, since if inheritance were truly equal, the primary effect of transfer taxation would be to narrow differences in wealth among families. In contrast, if inheritance were compensatory, then transfer taxation would have an uncertain effect on inequality, and any reduction would be overstated by between family effects alone.

Except for an article by Fyjalkowski-Bereday (1950) there appear to have been no studies bearing on the compensation issue. While equal inheritance among sons and daughters seems to be common, there is sufficient variation in empirical samples that this conclusion cannot be drawn prior to a careful investigation. Moreover, equality of inheritance may reflect zero inheritance to everyone, which does not test the hypothesis.

The principal findings of this study are as follows. First, there is scant <u>direct</u> evidence that inheritance is compensatory. However, for reasons to be explained, apparent equality may conceal true compensation. Second, sons and daughters do not seem to receive inheritances because of their contributions to the donor during his lifetime, although other recipients do inherit for this reason. Third, inheritances received by sons and daughters are strongly and negatively contingent on the survival of the spouse. Fourth, the probability of positive inheritance rises with family income and the estimated income elasticity of inheritance exceeds one. These findings support the suggestion of Pigou (1962) that inheritance contributes to the positive skewness of the income distribution.

Section II of the paper develops the basic model and two alternative hypotheses, one predicting Compensatory Inheritance, the other Equal or even Anticompensatory Inheritance. Section III describes the data and the approach used in the empirical work, Section IV presents the findings, while the final section summarizes the paper and suggests ways in which supplementary evidence could strengthen or amend its conclusions.

II. Alternative inheritance models

A. Basic analytical framework

The theoretical approach taken draws on earlier work by the author [Adams (1976, 1978)] and by Becker (1974). It is assumed throughout that the donor is an Altruist with respect to each recipient. Only the utility levels of recipients enter the donor's utility function, eliminating the composition of their consumption as a source of dispute. Therefore, the donor transfers unrestricted wealth to his recipients, and the amounts are determined subject to a budget constraint. Following the literature on separability in demand analysis [see Gorman (1959) and Strotz (1959)], if he is able to preallocate his wealth among recipients, the donor must possess a strongly separable lifetime utility function of the form

$$U = G_D(C_D) + \sum_j G_{Rj}\ (C_{Rj}), \qquad (1)$$

where C_D and the C_{Rj} are lifetime expenditures on consumption of the donor and the jth recipient respectively, while G_D and the G_{Rj} measure the respective contributions of the donor's and the jth recipient's consumption to the donor's utility.[2/] Moreover, G_{Rj} must be a monotonic transformation of the jth recipient's utility function, since only the utility of a recipient matters to an Altruistic donor. Certainty of length of life is assumed, although some implications of uncertainty are developed at a later point.

The donor's utility is maximized subject to his budget constraint,

$$W_D = C_D + \sum_j T_{Dj}, \qquad (2)$$

where W_D is his wealth and the T_{Dj} are gross transfers, or lifetime expenditures on the jth recipient, including the inheritance. Notice that recipients could contribute to C_D and be rewarded through inheritance, or by other means.

This approach rules out indifference on the part of the donor regarding the division of estates and other transfers, because consumptions of different recipients are imperfect substitutes. Evidence presented by Boskin (1976) supports this assumption by finding finite price effects of estate tax exemptions favoring charities.

Gross transfers are not equal to the amount received by j, defined as T_{Rj}, due to costs of making the transfers, and

$$P_{Rj}T_{Rj} = T_{Dj} \tag{3}$$

where P_{Rj} (which may depend on T_{Rj}) is the average cost of transferring T_{Rj} units of wealth, each worth one dollar.[3/] The net transfer of T_{Rj} dollars added to an endowment of E_{Rj} comprises the wealth of the jth recipient. Hence,

$$T_{Rj} + E_{Rj} = C_{Rj} \tag{4}$$

Maximizing (1) subject to (2), (3), and (4),

$$\begin{aligned}
&\frac{\partial U}{\partial C_D} - \lambda = 0 \\
&\frac{\partial U}{\partial C_{Rj}} - \lambda MC_{Rj} = 0 \\
&W_D - C_D - \sum_j T_{Dj} = 0,
\end{aligned} \tag{5}$$

where $MC_{Rj} = P_{Rj} + T_{Rj}\ dP_{Rj}/dT_{Rj}$, the jth marginal transfer cost.[4/] Second order conditions are assumed to be satisfied.[5/] Since this model implies equal marginal costs of transfers across different forms to any one recipient (see footnote 4), and because marginal costs of property transfers such as gifts and inheritances are the same for all recipients, this framework implies $MC_{Rj} = MC_{R\ell}$ for any two recipients j and ℓ in a sample where property transfers are made. From equation (5), this implies equalization of marginal utilities; hence $\partial G_{Rj} / \partial C_{Rj} = \partial G_{R\ell} / \partial C_{R\ell}$.

An absence of systematic favoritism is assumed with respect to sons and daughters. There is said to be no favoring between any two recipients j and ℓ if for equal consumption (hence $C_{Rj} = C_{R\ell}$) the donor receives equal marginal utilities, or $\partial G_{Rj}/\partial C_{Rj} = \partial G_{R\ell}/\partial C_{R\ell}$. The equality of marginal costs and the absence of favoritism imply the equalization of consumption among children, using (5) and the definition just given.[6/] In a sample where there is positive inheritance, children who have larger endowments receive smaller total transfers, since by equation (4) $T_{R\ell} > T_{Rj}$ if $E_{R\ell} > E_{Rj}$, assuming $C_{Rj} = C_{R\ell}$.

Under the conditions specified, the model suggests that total transfers, which assume many forms other than inheritance, are compensatory to the less advantaged children in a family. The conditions are shown geometrically in Figure 1 for a two recipient case. Line DF holds the sum of the two endowments constant. Point E represents the endowment point and assumes that 2 is the more advantaged recipient. Line AB indicates the trade-off between consumption of 1 and 2 and incorporates total transfers to each; it is drawn assuming equal transfer costs. If there is no favoritism, the equilibrium occurs at C, and equal consumption takes place.

In practice, compensation may be partial rather than complete, because transfers may not be large enough to offset the inequality of endowments and because there may be unsystematic favoritism. Nevertheless, even partial

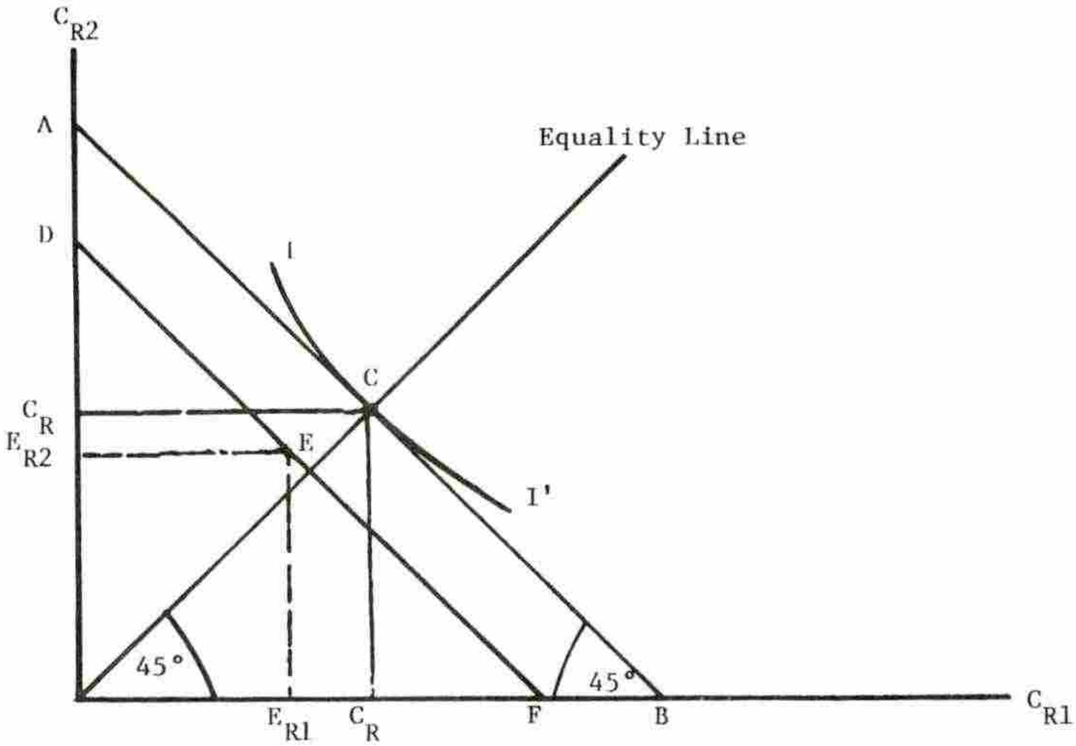

FIGURE 1 - Wealth Transfers and Compensation Within the Family

compensation reduces within family inequality. This can be shown as follows.

Compensation takes place if the difference in absolute value between the jth person's wealth and the mean wealth for the family is smaller than the absolute value of the difference in j's endowment and the mean endowment.[6/] Thus, if there is compensation

$$|W_{Rij} - W_{Ri}| = \alpha_{ij} |E_{Rij} - E_{Ri}|, \tag{6}$$

$0 \leq \alpha_{ij} \leq 1$. Here subscript i represents the ith family, W_{Rij} is the wealth of the jth member of the ith family, W_{Ri} is mean wealth of the ith family, and so forth. Notice that α_{ij} measures the degree of compensation, which is total if $\alpha_{ij} = 0$.

Following the conventions of the analysis of variance, the within family variance of wealth inclusive of transfers is

$$\sigma_w^2 = \sum_i \sum_j \frac{(W_{Rij} - W_{Ri.})^2}{N - 1}, \tag{7}$$

where N-1 is the total number of individuals. The within family variance of wealth prior to transfers, $\hat{\sigma}_w^2$, is the variance of endowments, Or

$$\hat{\sigma}_w^2 = \sum_i \sum_j \frac{(E_{Rij} - E_{Ri.})^2}{N - 1} \tag{8}$$

Clearly, $\hat{\sigma}_w^2 > \sigma_w^2$ and transfers reduce the variance, if (6) holds, since every squared term in (7) is less than its counterpart in (8) under these conditions.[8/]

The model must be extended if it is to encompass the effects of uncertainty, which are important in at least two ways. First, the income of recipients in future periods may shift relative to expectations. Second, transfers to a recipient may depend on the survival of others, particularly the spouse. In each case, the existence of alternative states of the world requires changes in the donor's plans.

Let us simplify by ignoring insurance and treating the donor's wealth as invariant with respect to these states. To be concrete, consider the case of a late decline in the recipient's income. The decline is equivalent to a decrease in the recipient's endowment, thereby encouraging an increase in transfers to him.[9/] Also, timing as well as size of the transfers is affected, since a larger fraction is received in later periods.

Contingent transfers can be handled by treating the recipient's consumption expenditures as stochastic rather than his wealth. For example, consider a change in the donor's marital state, which turns out to be empirically important. Since the spouse can draw any life span from the distribution of lifetimes, one can interpret widowed status as shorter life, holding the donor's age constant. The present value of expenditure on the spouse's consumption is also smaller because of the early termination of that consumption. The effect is a type of rationing by nature, in which different states of the world determine different consumption of the spouse. The analysis is similar to the conditional demand analysis developed by Pollak (1969).

Analytically, the donor's utility function in the kth state of the world is

$$U = G_D\,(C_D) + G_{R1}(C_{R1,k}) + \sum_{j\neq 1} G_{Rj}(C_{Rj}) \tag{9}$$

where the spouse is indexed by subscript 1 and the level of consumption by subscript k. The donor's net wealth constraint is

$$W_D^* = W_D - T_{D1,k} = C_D + \sum_{j\neq 1} T_{Dj} \tag{10}$$

By the budget constraint of the spouse, $T_{R1,k} = C_{R1,k} - E_{R1}$. Therefore smaller spousal consumption corresponds to smaller spousal transfers, and widowed marital state expands net wealth, $W_D - T_{D1,k}$. Transfers to others increase if their consumption is a normal good.[10/]

B. Compensatory and noncompensatory inheritance

The model predicts, under the conditions described, that total transfers lessen wealth inequality within families. Yet because of many forms of the transfers, it is unclear whether inheritance in particular reduces the inequality. The question becomes whether or not other transfers beside inheritance specialize in compensation. If specialization is unimportant, inheritance is compensatory. This is the null hypothesis.

The alternative hypothesis is that other forms of transfer are the principal sources of compensation. Relatively equal inheritance could be observed, or even a kind of inheritance seeming to exaggerate inequality.

At least two reasons can be given for specialization. First, gifts may be superior to inheritances for this purpose, because the donor is present to ensure the desired distribution of wealth.

In addition, the donor may encourage intersibling transfers through inheritance.[11/] Such transfers would be received by the less wealthy siblings, and would be equivalent to an increase in their wealth, since resources are freed which would otherwise have been spent in a market transaction.

To see why there are intersibling transfers, recall that the Altruistic Theory predicts selection of the cheapest mode of transfer (see footnote 4). But it is quite possible that sibling contributions such as time are the least expensive source, particularly if there is Altruism between siblings. The existence of the intersibling transfers creates an illusion by replacing a market transaction with a nonmarket one. Since payments for intersibling transfers are combined with compensatory transfers, one could observe a tendency towards apparent equality of the transfers, or even anticompensatory inheritance.

Figure 2 illustrates this illusion. The figure is identical to Figure 1 except for the introduction of the apparent transfer line GFH and the apparent consumption point F. As before, the true consumption point is C. However, because of intersibling transfers, it seems that 2 who has the larger endowment, also receives a larger inheritance than 1. Apparent consumption of the two recipients is $\hat{C}_{R2}$ and $\hat{C}_{R1}$ and inheritances in this example seem to accentuate

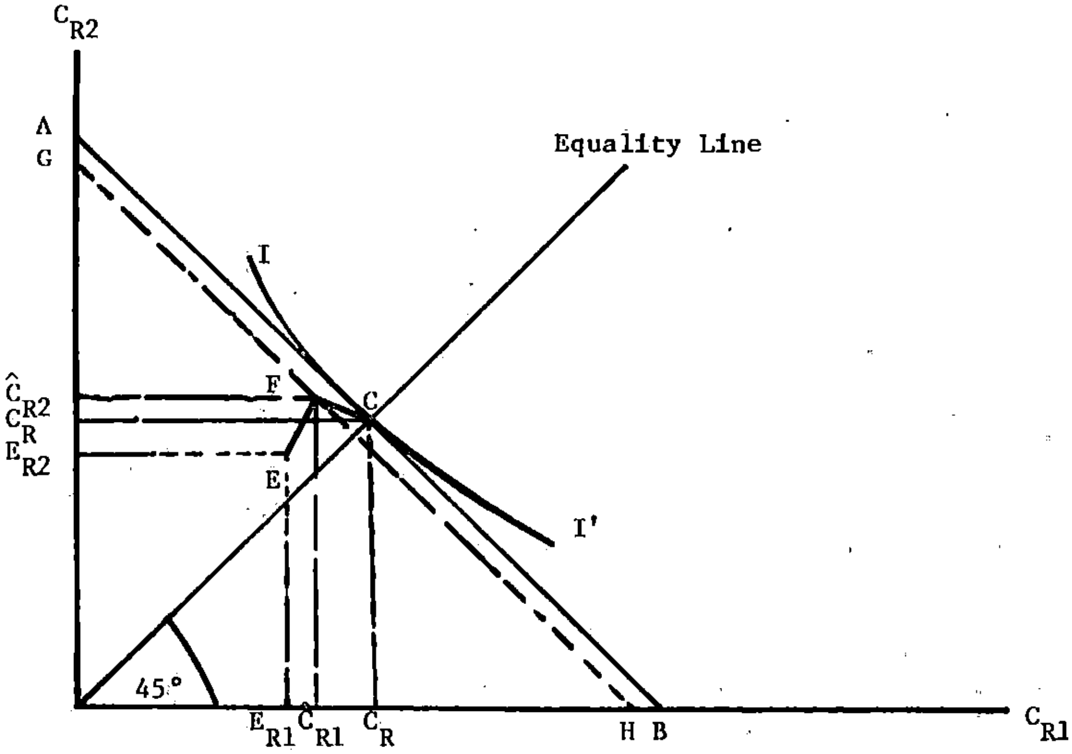

FIGURE 2 - Intersibling Transfers and Apparent Absence of Compensation

inequality. However, unmeasured intersibling transfers equalize consumption and $\hat{C}_{R2} - C_R$ is the cost of such transfers in terms of gift and inheritance, while the gain is $C_R - \hat{C}_{R1}$. Since $C_R - \hat{C}_{R1}$ exceeds $\hat{C}_{R2} - C_R$, the donor indirectly acheives a net gain. These explanations suggest that inheritances and other monetary transfers are indirectly compensatory.

C. Other reasons for a noncompensatory inheritance

A different explanation relies on jealousy among the siblings or negative interdependencies in their mutual consumption. Yet it seems largely unconvincing, for reasons of symmetry in the negative interdependencies. For example, the denial of a larger inheritance to a poorer sibling harms the poorer in the same manner as it would the wealthier sibling were compensation to occur. To illustrate, let there be two recipients and let the utility functions of each recipient depend negatively on the other's consumption, so the G_{Rj} entering (1) are of the form

$$G_{Rj} = G_{Rj}(\overset{(-)}{C_{Ri}}, \overset{(+)}{C_{Rj}}) \qquad (i,j = 1,2) \qquad (11)$$

where the - and + indicate negative and positive marginal utilities respectively. Maximizing as before,

$$\left(\frac{\partial G_{R1}}{\partial C_{R1}} + \frac{\partial G_{R2}}{\partial C_{R1}}\right) - \lambda MC_{R1} = 0$$

$$\left(\frac{\partial G_{R1}}{\partial C_{R2}} + \frac{\partial G_{R2}}{\partial C_{R2}}\right) - \lambda MC_{R2} = 0 \qquad (12)$$

are obtained as the first order conditions. But if the G_{Rj} are symmetric, then the parenthetical expressions of (12) would be equal evaluated at $C_{R1} = C_{R2}$, and the absence of compensation would remain unexplained.

A second explanation assumes the donor is uncertain about relative wealth positions of siblings and bequeaths to them equally. This explanation also seems unappealing if the donor bases his decisions on expected values, since there are differences in sibling characteristics (for example, years of schooling) which cause their expected wealth to differ.

III. Data base and study design

The data used in this study derive from a five percent random sample of probate records for the city of Cleveland, Ohio, U.S.A. in the year 1965.[12/] The probate data were combined with information from interviews of survivors, yielding a basic sample of 659 estates and 1234 survivors. Due to the interview procedure, an unusual combination of variables was obtained. Recipient characteristics include material inheritance and educational attainment, marital status, relationship to the deceased, usual number of visits to the deceased, and monthly family income. Among the significant family level characteristics are the number of inheritors, next of kin, or siblings, age of the deceased, his marital status, and his education.

Because of random selection, the estates are representative in size; few are taxable under the U.S. Federal Estate Tax. As a consequence, inheritances are modest in size, and a majority in every sample assume a value of zero or one thousand dollars.[13]

Let us investigate the characteristics of inheritance among sons and daughters, who constitute the majority of inheritors. Table 1 shows the incidence of equal inheritance for two samples.[14] Panel A of the table looks at all cases, where 71% inherit equally. However, equality is tautological either in the case where one son or daughter inherits, or in cases where all of the children receive a zero inheritance. Panel B is therefore based on a restricted sample where there is more than one sibling and mean inheritance is positive. It becomes clear that equality is largely an artifact of the tautological causes mentioned above. In only 10% of the smaller, relevant sample do we observe equality.

Table 2 looks at the equality issue differently by computing within and between family standard deviations of inheritance for all sons and daughters. The within family deviation is small judged by related variation in recipient characteristics, only 35% of the between family deviation. For example, the corresponding ratios for recipient's education and income are 62% and 95%. Despite the fact that the within family standard deviation contains an automatic

TABLE 1

INCIDENCE OF EQUAL INHERITANCE

SUBSAMPLE OF SONS AND DAUGHTERS

Sample and Size of Inheritance Relative to the Mean for Children	Decedent Married		Decedent Unmarried	
	Number	%	Number	%
A. All Cases (N = 410)				
Above Mean	15	5.9	60	24.4
Equal to Mean	226	88.3	64	39.0
Below Mean	15	5.9	40	36.6
Total	256	100.1	164	100.0
B. More than one Sibling, Mean Inheritance Positive (N = 145)				
Above Mean	15	44.1	60	36.0
Equal to Mean	4	11.8	11	9.9
Below Mean	15	44.1	40	54.1
Total	34	100.0	111	100.0

NOTE: The mean for each family is computed only for sons and daughters. The computation uses the logarithmic form employed in the empirical work, where zero inheritances are equated to thousand dollar inheritances in logs.

TABLE 2

WITHIN AND BETWEEN FAMILY STANDARD DEVIATIONS
OF INHERITANCE, AND MEAN INHERITANCE,
SUBSAMPLE OF SONS AND DAUGHTERS
(N = 410)
(Inheritance in Logarithms Except Where Noted)

Within Family Standard Deviation[a]	Between Family Standard Deviation[b]	Mean[c]	
		Logarithmic	Geometric ($1000)
0.308	0.871	0.590	1.804

NOTE: The within family standard deviation is the square root of the mean within family sum of squares. The between family standard deviation is the square root of the between family sum of squares. See below for precise definitions.

a Defined as $\sqrt{\dfrac{\sum\sum_{ij} (X_{ij} - X._j)^2}{N - 1}}$ where X_{ij} is the individual inheritance of the ith individual in the jth family and $X._j$ is the mean inheritance for the jth family.

b Defined as $\sqrt{\dfrac{\sum_j N_j(X._j - X..)^2}{N - 1}}$ where N_j is the number of observations for the jth family and X.. is the grand mean for the entire subsample of inheritances.

c The logarithmic mean is the mean of the logarithms of the inheritances; the geometric mean is the antilogarithm of the logarithmic mean.

downward bias, for the reasons noted in connection with Table 1, it is far from equal to zero. We conclude that a search for compensation should be undertaken using techniques which isolate effects of variation in individual wealth on inheritance. Simple tabular analysis does not establish dominance of the alternative, equal inheritance.

We enter a number of controls in the estimating equations, followed by <u>indicators</u> of recipient's wealth. Several of the controls are measured at the family level and pertain to all recipients. Among these are mean family income in logarithms, marital status and age of the deceased, number of siblings or next of kin, and mean labor force participants in families of recipients. The individual recipient characteristics include number of usual visits to the deceased during his lifetime, education, marital status, and number of labor force participants in the recipient's family. The last three of these are entered as indicators of the recipient's wealth.

The detailed discussion of the connection between the explanatory variables and the theoretical model of Section II is deferred for convenience to the next section, but it is useful to illustrate here the general nature of the approach. If children with greater education are more able, as we could expect, then their endowment is greater and they should receive a larger inheritance according to the compensatory hypothesis. Effects of inheritance on intrafamily wealth inequality are tested indirectly through the test for the existence of compensation.

Table 3 describes the variables. All except mean family income are self-explanatory, so we turn in closing to a discussion of this variable. Originally income in the data is monthly family income of recipients, coded in nine intervals. The monthly dimension of income is a serious weakness if one seeks permanent income of the family to explain the inheritances. Income is

TABLE 3

DESCRIPTION OF VARIABLES, SUBSAMPLE OF
SONS AND DAUGHTERS
(N = 410)

Variable	Mean	Standard Deviation
Family Characteristics		
Log of Mean Family Income in $	6.607	0.318
Marital Status of the Deceased (= 1 if unmarried, 2 if married)	1.602	0.490
Age of the Deceased in Years	70.568	8.577
Education of the Deceased in Years	7.604[a]	3.993[a]
Number of Inheritors	2.527	2.190
Number of Next of Kin	4.294	1.825
Number of Siblings	2.333	1.247
Individual Characteristics[b]		
Education of Recipients in Years	12.432	2.368
Marital Status of Recipient (= 0 if unmarried, 1 if married)	0.954	0.211
Number of Labor Force Participants in Recipient's Family	1.680	0.792
Usual Number of Visits by Recipient[c]	1.990	0.877

[a] Calculation based on sample of N = 392, due to missing values.

[b] Means of individual characteristics entered wherever multicollinearity problems do not intervene.

[c] Coding is 1 if daily, 2 if weekly, 3 if monthly, 4 if less often.

refined in three steps. First, it is coded in dollars by assigning midpoints to closed intervals, and using the Pareto distribution to estimate a mean for the uppermost open interval.[15] Second, to purge transitory errors in monthly income, recorded income is regressed on the characteristics of the individual and the estimated equation is used to calculate predicted or permanent income.[16] Finally, predicted income is averaged by family and treated as a proxy for parental wealth. It certainly outperforms actual mean income as a predictor of inheritance in test regressions.

IV. Empirical Findings

Table 4 tests for evidence of inheritance compensation by two alternative methods. Equations 4.1 and 4.2 use levels of the explanatory variables to explain the level of inheritance. Equations 4.3 and 4.4 instead use deviations of the independent variables from their respective family means to explain the deviation of inheritance. In all cases, inheritance is coded in logarithms.

Level equations are studied first. Since inheritance has a lower limit of zero, the equation residuals have a truncated Normal distribution, and Tobit analysis is the appropriate estimation technique.[17] Different samples are used in 4.1 and 4.2; 4.1 uses all the observations on sons and daughters meeting the selection criteria, while 4.2 is based on a subsample of unmarried decedents, since in other cases zero inheritance to children is predominant.

The set of compensatory variables in these equations consists of recipient's education, recipient's marital status, and the number of labor force participants in the recipient's family. More educated sons and daughters, or married children, are expected to receive smaller inheritances under compensation because they have larger endowed wealth. Higher education within a family is associated with greater ability and wealth, while married endowed wealth is larger due

TABLE 4

SONS AND DAUGHTERS INHERITANCE EQUATIONS
(Asymptotic Standard Errors in Parentheses)

Variable or Statistic	TOBIT Estimates[a]		OLS Estimates[b]	
	4.1	4.2[c]	4.3	4.4[c]
Log of Family Income	1.663[d] (0.444)	1.895[d] (0.477)		
Marital Status of the Deceased	-2.276[d] (0.183)			
Age of the Deceased	0.002 (0.010)	-0.017 (0.012)		
Number of Siblings	-0.221[d] (0.073)	-0.171[d] (0.077)		
Mean Number of Labor Force Participants Among Siblings	-0.640[d] (0.225)	-0.754[d] (0.254)		
Education of Recipient	-0.038 (0.050)	-0.056 (0.053)	-0.014 (0.013)	-0.022 (0.026)
Number of Labor Force Participants in Recipient's Family	-0.089 (0.108)	-0.155 (0.122)	-0.024 (0.016)	-0.059 (0.039)
Marital Status of Recipient	-0.817[d] (0.361)	-0.546 (0.364)	-0.785[d] (0.114)	-1.226[d] (0.240)
Usual Number of Visits by the Recipient	0.016 (0.094)	-0.022 (0.102)	-0.040 (0.032)	-0.079 (0.059)
(Constant)	-5.102	-7.327	0.010	0.042
Standard Error	1.341	1.105	0.297	0.414
X^2	5.582			
R^2			0.118	0.166
F-Statistic			13.546	7.912
N	410	164	410	164

TABLE 4 con't.

[a] Dependent variable is zero if the inheritance is zero, and the logarithm of inheritance otherwise.

[b] Dependent variable is the deviation of inheritance (coded as in a) from its family mean; similarly, independent variables are entered as deviations from their means.

[c] Sample of unmarried decedents.

[d] Estimate significantly differs from zero at the five percent level.

to household complementarities between spouses. The role of the number of labor force participants is less clear. More persons may work due to lower wealth (the "added worker" hypothesis), or because there is less intrinsic specialization in household work, so that greater wealth is achieved if both spouses work. Briefly, the results (see 4.1 and 4.2) show that education and marriage have the expected signs, though only marriage is significant.[18/] Evidence of compensation appears meager.[19/] The participation variable at the level of the recipient is insignificant in these equations.

Usual visits to the deceased during his lifetime are included to test for evidence of inheritance due to contributions to the donor. The fluctuating sign and insignificance of visits suggest that contributions do not affect inheritance.

Let us turn to a discussion of the family wide variables included in 4.1 and 4.2. First, inheritance seems to be income elastic, judging by the coefficient on family income, although the estimate does not differ significantly from one. Second, married decedents leave smaller inheritances than unmarried ones, an effect interpreted in Section II as a stochastic increase in expenditures upon the spouse and decrease in net wealth that can be spent on others. The size of the effect indicates a dominance of the spouse in inheritance, explicable in terms of the lifelong contributions of the spouse to income and savings [see Posner (1972, Ch. 17)]. An increase in the number of siblings diminishes inheritance, a quantity effect which has an interpretation similar to donor's marital state.[20/] Donor's age is unimportant in either equation. Finally, mean number of labor force participants among recipients is entered as a corrective for mean family income, since the latter may appear to increase simply because more persons work, despite constant or even declining per capita income.

Equations 4.3 and 4.4 measure all variables in deviations from family means, and explain the pure within family variation of inheritance. Since inheritance is no longer truncated at zero, the equations are estimated using ordinary least squares. Family level variables are eliminated by this procedure. The compensation hypothesis would argue that the deviation of inheritance should be negatively related to the deviation of recipient's education and marital status. The story which these equations tell is the same as the one told by the Tobit equations. Only recipient's marital status is significant among the regressors.

The combined results of Table 4 have an interesting interpretation. None of the recipient wealth indicators significantly affect inheritance, including individual income (omitted from this summary), with the exception of the recipient's marital status. Likewise, all of the indicators are persistent traits either of the recipients themselves or their families, again with the exception of the recipient's marital state. Certainly this remark holds true of education and income of the recipients, and a recent investigation by Heckman (1977) suggests that the interperiod correlation of labor force participation is strongly positive even for married women, despite their weaker attachment to the labor force.

In contrast, whether because of death, divorce, or separation, recipient's marital state can undergo sudden and unexpected change. Its impact on inheritance may reflect late compensation due to a deviation of the recipient's prospects from the expectation. We are led to suppose that compensation is otherwise concealed, either through planned completion prior to inheritance, or planned attenuation through combination with intersibling transfers.

Table 5 carries the study further by examining more heterogeneous samples for different behavior. All equations are Tobit estimates for the reason explained in connection with Table 4. Equations 5.1 and 5.2 are run on samples

TABLE 5

NUCLEAR FAMILY AND FULL SAMPLE
INHERITANCE EQUATIONS[a]

(Asymptotic Standard Errors in Parentheses)

Variable or Statistic	Tobit Estimates		
	5.1[b]	5.2[c]	5.3[d]
Log of Family Income	2.205[e] (0.425)	1.646[e] (0.484)	1.019[e] (0.314)
Marital Status of the Deceased	-2.017[e] (0.179)	-1.945[e] (0.186)	-1.756[e] (0.160)
Age of the Deceased	-0.029[e] (0.009)	-0.013[e] (0.012)	-0.014[e] (0.007)
Number of Next of Kin	-0.148[e] (0.052)	-0.134[e] (0.058)	-0.065[e] (0.023)
Mean Number of Labor Force Participants Among Recipients	-0.614[e] (0.214)	-0.534 (0.273)	-0.418[e] (0.183)
Percent of Recipients Married		0.052 (0.718)	
Education of Recipient	-0.116[e] (0.047)	-0.088 (0.047)	-0.010 (0.037)
Number of Labor Force Participants in Recipient's Family	-0.096 (0.105)	-0.126 (0.122)	-0.094 (0.093)
Marital Status of Recipient	-1.677[e] (0.272)	-1.774[e] (0.456)	-1.573[e] (0.256)
Usual Number of Visits by the Recipient	-0.065 (0.096)	0.002 (0.098)	-0.274[e] (0.077)
(Constant)	-4.800	-2.775	-2.000
Standard Error	1.390	1.115	1.465
X^2	22.561[e]		59.288[e]
N	440	289	576

TABLE 5 con't.

[a] Dependent Variable is zero if the inheritance is zero, and the logarithm of inheritance otherwise.

[b] Sample of spouses and sons and daughters.

[c] Sample as in (b), but number of recipients must exceed one.

[d] Combined sample of all recipients.

[e] Estimate significantly differs from zero at the five percent level.

which include spouses as well as sons and daughters. The sample on which 5.2 is based in addition requires that the number of recipients exceed one, thereby excluding in another way downward bias in inheritance variation (see Section III for a discussion). The two principal differences between Table 4 and these equations are the higher income elasticity of inheritance, and the significance of recipient's education. Of the two sets of estimates these would seem the superior ones since the calculations include parental incomes, surely closer to the ideal than recipient incomes taken at random. On the other hand, the education effect is not likely to reflect compensation, but increased parental wealth. The greater endowment of spouses initiates redistribution in favor of sons and daughters.

The final equation (5.3) is fitted to data for all recipients. The principal difference from earlier findings is the significance of visits during the lifetime.

The Tobit calculations can be used to extend understanding of the distributional effects of inheritance. If the probability of positive inheritance rises with income, this finding and the high income elasticities of Table 5 would imply that inheritance does contribute to the positive skewness of income and wealth. The Tobit coefficients are used to calculate probabilities of positive inheritance, assuming a set of traits for the recipient.[21/] Four calculations are performed on both the sons and daughters sample, and the full sample, based on differing assumptions about the donor's marital state (married or unmarried) and mean family income (low and high for the sample of sons and daughters). Sons and daughters are assigned the same characteristics as recipients in general; therefore, computed probabilities differ only because coefficients for the two samples differ. Table 6 contains the estimated probabilities. Sons and daughters have a consistently larger probability of

PROBABILITY OF RECEIVING POSITIVE INHERITANCE IN LOGARITHMS[a]

Probability for Assumed Characteristics of:	Estimates used Coefficients Calculated on	
	Sons and Daughters Sample[b]	Full Sample[c]
Recipient I[d]	0.01	0.00
Recipient II[e]	0.20	0.04
Recipient III[f]	0.48	0.06
Recipient IV[g]	0.95	0.35

$$\text{Probability} = \int_{a}^{\infty} \frac{1}{\sqrt{2\Pi}} e^{-\frac{1}{2}(u_i/\sigma)^2} du_i ,$$

$$\text{where } a = \frac{-x_i'\beta}{\sigma} .$$

[a] Corresponds to probability of receiving an inheritance larger than one thousand dollars.

[b] The equation used is 4.1.

[c] The equation used is 5.3.

[d] Monthly family income is assumed to be $285; the donor is assumed to be married, aged 70, with number of siblings equal to 2 (next of kin equal to 4 in the full sample); two persons are at work for every recipient, all recipients are married, all have a high school education and all make weekly visits to the donor.

[e] Values as in d, except donor is assumed to be unmarried.

[f] Values as in d, except monthly income of the family is assumed to be $1992.

[g] Values as in d, except donor is assumed to be unmarried and monthly family income is assumed to be $1992.

receiving a positive inheritance than recipients in general. The probability for sons and daughters rises dramatically from 0.01 to 0.20 for low income families is the spouse is absent; but the chance is 0.48 even if the spouse survives given a high income. Only in the case which assumes an unmarried donor. and high income is the probability ever above 0.20 for recipients in general.

Because our principal concern is with the nuclear family, and since spouses, sons and daughters dominate inheritance, it is clear that both the probability and size of inheritance increase with income. Therefore, inheritance contributes to the inequality of wealth between families and its positive skewness. Moreover, since the evidence of compensation is meager, inheritance except for possible concealed effects seems to contribute similarly to the inequality of wealth between individuals.

V. Conclusion

This study has uncovered a number of findings concerning the link between inheritance and wealth inequality. First, inheritance does not at least directly compensate children for comparative disadvantages. Equal inheritance appears to predominate. This paper has argued that transfer compensation is concealed, either because of intersibling transfers, or because it is substantially completed prior to inheritance.

If the intersibling transfers are the correct explanation, it is important to consider that inheritance samples are secretly heterogeneous. They combine subsamples of zero and positive intersibling transfers, and inheritance compensation should be observable in the former subsample. However, it cannot be said that this part of the theory has yet been subjected to a rigorous test.

The second finding is that spouses, sons, or daughters do not receive inheritance because of their contributions, measured by the frequency of their visits to him during his lifetime. Nevertheless, other recipients do inherit for this reason; this divergence of behavior may stem from the reverse Altruism of closely related inheritors.

Third, the size of inheritance depends markedly on the number of siblings or next of kin, and the donor's marital state, findings attributed here to quantity or rationing effects.

Fourth, both the income elasticity of inheritance and the dependence of the probability of positive inheritance upon income suggest that it contributes to inequality by fattening the upper tail of the wealth distribution.

Two suggestions are made to guide the direction of further research on the compensation issue. The alternative explanations for the seeming absence of compensation provide the clues. In the first place, more must be known about the size, form and distribution of gifts during the lifetime if additional progress is to be made in understanding the mechanism of intergenerational transfers as a whole. Gifts within the family appear to be severly under-reported in available data sets, and their importance has been correspondingly underestimated.[22/] Additional evidence on gifts of the kind described will enable researchers to gauge the importance of compensation through gifts. In the second place, variables such as the distance between siblings, the length of time they have been separated, and visits by one sibling to another should provide an avenue for evaluating the importance of intersibling transfers, especially in attenuating compensation through inheritance. Perhaps if these steps are undertaken, our understanding of intergenerational relationships and their link with wealth distribution will advance substantially beyond its present scope.

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FOOTNOTES

1/ I wish to thank Marvin B. Sussman and Judith N. Cates for permission to use their data, and also for generous assistance in providing documentation. I would also like to thank Ralph Schnelvar for programming advice and the provision of the Tobit program used in the study. Lawrence W. Kenny, Theodore W. Schultz, and Nigel Tomes provided valuable comments on an earlier draft. Any remaining errors are my responsibility.

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2/ This is the indirect utility function, which assumes prior maximization with respect to individual commodities. Thus the G_D and G_{Rj} are functions of commodity prices and expenditures, after the substitution of demand functions into the utility function. In the formulation used in the text, commodity prices are suppressed because they are unvarying. The expenditures pertain to each recipient alone because of the separability assumption. See Strotz (1959).

3/ The T_{Dj} are sums, or

$$T_{Dj} = \sum_i \sum_k \frac{P_{ikj}T_{ikj}}{(1+r)^i} \tag{a}$$

where P_{ikj} is the price of transferring one dollar of the kth form of transfer (land, human capital, household time) in the ith period to the jth recipient, and T_{ikj} is the number of units received by j in that period and that form. Therefore, from (a),

$$P_{Rj} = \frac{\sum_i \sum_k \frac{P_{ikj}T_{ikj}}{(1+r)^i}}{\sum_i \sum_k T_{ikj}}, \tag{b}$$

so that PR_j is a weighted average.

4/ The theory implies that marginal costs are equated across forms of the transfers which are made to a recipient. Substitute (a) in footnote 3 into the budget constraint (3), and maximize(1) with respect to each transfer component separately, and it will be found that

$$\frac{\partial U}{\partial C_{Rj}} \frac{1}{(1+r)^i} - \lambda MC_{ikj} \frac{1}{(1+r)^i} = 0, \tag{c}$$

if a transfer is made. Hence $MC_{ikj} = MC_j = \frac{\partial U}{\partial C_{Rj}} / \lambda$. If asset transfers are made $MC_i = MC_\ell$, since taxation, etc. typically do not differ for recipients.

5/ The second order conditions require that bordered diagonal determinants of the form

$$(-1)^{N+1}\begin{vmatrix} G''_D & 0 & \cdots & 0 & -1 \\ 0 & G''_D - \lambda \dfrac{dMC_{R1}}{dT_{R1}} & & 0 & -MC_{R1} \\ \vdots & & \ddots & & \vdots \\ 0 & \cdots & 0 & G''_N - \lambda \dfrac{dMC_{RN}}{dT_{RN}} & -MC_{RN} \\ -1 & -MC_{R1} & \cdots & -MC_{RN} & 0 \end{vmatrix}$$

alternative in sign, beginning with a positive sign for $N = 1$. Expanding the determinant for $N = 1$, a sufficient condition for the determinant to be positive is that G''_D, G''_{R1} be negative or that G-functions be concave.

6/ Relatives of different degree should be treated separately. One reason, stressed by the sociobiologists, is that the sharing of genes and the amount of Altruism decline as relationships become more distant.

7/ For example, the deviation of wealth from the family mean is less negative than the deviation of the endowment from its family mean.

8/ $(E_{Rij} - E_{Ri.})^2 > (W_{Rij} - W_{Ri.})^2 = \alpha_i^2\,(E_{Rij} - E_{Ri})^2$, if $0 < \alpha_i < 1$.

9/ Differentiating the first order conditions (5), $1 > \partial C_{Rj}/\partial E_{Rj} > 0$, since other consumption is a normal good. Hence,

$$\partial T_{Rj}/\partial E_{Rj} = \partial C_{Rj}/\partial E_{Rj} - 1 < 0.$$

10/ To see this analytically, solve the donor's problem subject to W^*_D of (10), then derive wealth effects on the assumption that $dW^*_D = -dT_{D1,k}$.

11/ Tomes (1977) stresses the importance of intersibling transfers.

12/ The data are described in Sussman, Cates, and Smith (1970).

13/ The distribution for the sample of sons and daughters is: zero to one thousand dollars, 247 cases; two to five thousand dollars, 111 cases;

six to ten thousand dollars, 23 cases; eleven to twenty thousand dollars, 20 cases; and twenty-one thousand dollars and over, 9 cases; or 410 cases in total.

14/ In general, requirements for an observation to be included in any sample were that recipients be between the ages of 25 and 65, the source of their income be known, that someone in their family be currently working, the principal wage earner be male, and that education of recipients be known.

15/ The Pareto equation is useful for approximating the upper tail of income distributions. Its form is

$$\ell nN = K - \alpha \log X, \qquad (d)$$

where N = number of persons whose income is at or above level X. For this study cells by recipient's age and income were created and α was estimated from the cell data. The estimate obtained was $\hat{\alpha} = 1.68$. Bowley (1920), pp. 462-463 shows that mean income equal to or exceeding level X, for a Pareto distribution is

$$\bar{X} = \frac{\alpha}{\alpha-1} X_1. \qquad (e)$$

Hence, since X_1 is known and $\hat{\alpha}$ is estimated from the Pareto regression, $\bar{X}$ can be estimated.

16/ The equation estimated was (standard errors in parentheses)

$$\begin{aligned} \text{LMINC} = 5.832 &+ \underset{(0.008)}{0.083}\ \text{YEDR} + \underset{(0.002)}{0.009}\ \text{AGER} + \underset{(0.076)}{0.016}\ \text{MARR} \\ &+ \underset{(0.037)}{0.239}\ \text{NWAGR} - \underset{(0.103)}{0.408}\ \text{RACER} - \underset{(0.022)}{0.136}\ \text{RES} + \underset{(0.128)}{0.016}\ \text{REL1} \\ &- \underset{(0.128)}{0.087}\ \text{REL2} + \underset{(0.150)}{0.340}\ \text{REL3} + \underset{(0.034)}{0.090}\ \text{REL4},\ R^2 = 0.400,\ N = 583. \end{aligned}$$

In this equation, LMINC = ℓn (actual monthly income), YEDR = years of schooling, AGER = age in years; MARR = 0 if recipient is not married, 1 if married; RACER = 0 if recipient is white, 1 if he is black; RES = quality of housing, and REL1 through REL4 assume values of 1 if the recipient is Protestant, Catholic, Jewish or Eastern Orthodox, 0 otherwise (unknown category omitted).

17/ The equation is such that for the t^{th} observation,

$$Y_t = \begin{cases} X_t\beta + U_t & \text{RHS} \geq 0 \\ 0 & \text{RHS} < 0, \end{cases} \qquad (f)$$

where Y_t is the dependent variable (inheritance), X_t the row vector of independent variables, and β the column vector of coefficients. It is usually assumed that $U_t \sim N(0,\sigma^2)$. This nonlinear problem (of estimating β) is solved using maximum likelihood. See Amemiya (1973) and Tobin (1958) for discussions of the general method.

18/ Very similar results were found in smaller samples where the within family variation of inheritance is expected to be greatest, namely those which require the number of recipients to exceed one, and/or the spouse to be absent.

19/ The χ^2 statistics in Table 4 test for the importance of recipient characteristics as a group and find them insignificant. The statistics themselves are twice the absolute value of the difference in the logarithms of the likelihood functions with and without entry of the recipient characteristics, and the degree of freedom is the difference in the number of coefficients fitted. See Brownlee (1965), pp. 111-113 for a discussion. For an application to Tobit, see Tobin (1958).

20/ Number of siblings is assumed to be independent of inheritance size, so that causation runs only in the direction of inheritance.

21/ Referring to fn. 17, the probability is the same as the probability that $Y_t > 0$, or $U_t/\sigma \geq -X_t\beta/\sigma$. But $U_t/\sigma \sim N(0,1)$, and the probability is the upper tail area of the normal distribution.

22/ Dickinson (1970), Table 2.1, p. 41, finds that charitable gifts as recorded in income tax data are over ten times larger than charitable bequests; while noncharitable gifts are a minor fraction of noncharitable bequests according to Shoup (1966).

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